

## CLAIMS

What is claimed is:

- 1 1. A method comprising:  
2 receiving packet data;  
3 concatenating the packet data into a Time Division Multiplexing (TDM)  
4 Synchronous Optical Network (SONET) signal, wherein the concatenation can be across  
5 any locations within the TDM SONET signal and wherein a size of the concatenation can  
6 be in increments of single SONET frames; and  
7 transmitting the TDM SONET signal having the concatenated packet data .
- 1 2. The method of claim 1, wherein the packet data is concatenated within locations  
2 in the TDM SONET signal not occupied by TDM data traffic.
- 1 3. The method of claim 1, wherein the transmitting of the TDM SONET signal is  
2 between two network elements in a network ring.
- 1 4. A method comprising:  
2 receiving a number of packets within a first Time Division Multiplexing (TDM)  
3 Synchronous Optical Network (SONET) signal having a number of SONET frames,  
4 wherein the packets are concatenated across any of the number of SONET frames within  
5 the first TDM SONET signal, such that a size of the concatenation can be in increments  
6 of single SONET frames;  
7 upon determining that the number of packets are being transmitted to a first  
8 location that cannot extract the number of packets from any of the number of SONET  
9 frames in the first TDM SONET signal, performing the following:  
10 extracting the number of packets from the first TDM SONET signal;

11 filling a number of SONET frames in a second TDM SONET signal with  
12 transmission data that includes the number of packets, wherein the filling is equally  
13 interleaved across the number of SONET frames in the second TDM SONET signal and;  
14 transmitting the second TDM SONET signal to the first location; and  
15 upon determining that the number of packets are being transmitted to a second  
16 location that can extract the number of packets from any of the number of SONET frames  
17 in the first TDM SONET signal, transmitting the first TDM SONET signal to the second  
18 location.

1 5. The method of claim 4, wherein the first location is a network element that is  
2 external to a network ring.

1 6. The method of claim 4, wherein the second location is a network element that is  
2 internal to a network ring.

1 7. A method comprising:  
2 receiving portions of packets;  
3 placing the portions of packets into buffers;  
4 determining packet boundaries among the portions of packets in the buffers,  
5 wherein the determining of the packet boundaries locates a number of packets;  
6 concatenating the number of packets into a Time Division Multiplexing (TDM)  
7 Synchronous Optical Network (SONET) signal, wherein the concatenation can be across  
8 any locations within the TDM SONET signal and wherein a size of the concatenation can  
9 be in increments of single SONET frames; and  
10 transmitting the TDM SONET signal having the number of concatenated packets.

1 8. The method of claim 7, wherein the number of packets are concatenated within  
2 locations in the TDM SONET signal not occupied by TDM data traffic.

1 9. The method of claim 7, wherein the transmitting of the TDM SONET signal is  
2 between two network elements in a network ring.

1 10. A network element of a network ring comprising:  
2 physical connection circuitry having a number of buffers, the number of buffers to  
3 hold packet data received from a different network element that is external to the network  
4 ring, the physical connection circuitry to determine packet boundaries from the packet  
5 data; and  
6 packet processing circuitry coupled to the physical connection circuitry, the  
7 packet processing circuitry to receive the packets from the physical connection circuitry  
8 and to concatenate the packets into any location with a Time Division Multiplexing  
9 (TDM) Synchronous Optical Network (SONET) signal.

1 11. The network element of claim 10, wherein a size of the concatenation can be in  
2 increments of single SONET frames.

1 12. An apparatus comprising:  
2 a number of ports, each of the number of ports to receive a number of packets  
3 within a first Time Division Multiplexing (TDM) Synchronous Optical Network  
4 (SONET) signal having a number of SONET frames, wherein the number of packets is  
5 concatenated across any of the number of SONET frames within the first TDM SONET  
6 signal, such that a size of the concatenation can be in increments of single SONET  
7 frames;

a number of buffers coupled to the number of ports, the number of buffers to hold the number of packets received from the number of ports; and

a processing element coupled to the number of ports and the number of buffers, the processing element to perform the following:

upon determining that the number of packets are being transmitted to a first location that cannot extract the number of packets from any of the number of SONET frames in the first TDM SONET signal, performing the following:

extracting the number of packets from the first TDM SONET signal;

filling a number of SONET frames in a second TDM SONET signal with transmission data that includes the number of packets, wherein the filling is equally interleaved across the number of SONET frames in the second TDM SONET signal and;

transmitting the second TDM SONET signal to the first location;

and

upon determining that the number of packets are being transmitted to a second location that can extract the number of packets from any of the number of SONET frames in the first TDM SONET signal, transmitting the first TDM SONET signal to the second location.

13. The apparatus of claim 12, wherein the first location is a network element that is external to a network ring.

14. The apparatus of claim 12, wherein the second location is a network element that is internal to a network ring.

15. A network comprising:

2 a first set of network elements, at least one of the first set of network elements to  
3 transmit packet data; and

4 a second set of network elements, the second set of network elements to transmit  
5 a Time Division Multiplexing (TDM) Synchronous Optical Network (SONET) signal,  
6 the TDM SONET signal having a number of SONET frames, wherein each of the first set  
7 of network elements includes:

8 physical connection circuitry having a number of buffers, the number of  
9 buffers to hold portions of the packet data received from the at least one of the first set of  
10 network elements, the physical connection circuitry to determine packet boundaries for  
11 the packet data; and

12 packet processing circuitry coupled to the physical connection circuitry,  
13 the packet processing circuitry to receive the packets from the physical connection  
14 circuitry and to concatenate the packets into any location with a Time Division  
15 Multiplexing (TDM) Synchronous Optical Network (SONET) signal.

1 16. The network of claim 15, wherein the number of packets are concatenated within  
2 locations in the TDM SONET signal not occupied by TDM data traffic.

1 17. The network of claim 15, wherein the at least one non-ring network element  
2 includes a router.

1 18. The network of claim 15, wherein a communication of packets between the  
2 number of network elements and the at least one non-ring network element is within a  
3 TDM SONET signal such that the number of frames transmitting the number of packets  
4 are concatenated evenly across the TDM SONET signal.

1 19. A machine-readable medium that provides instructions, which when executed by  
2 a machine, cause said machine to perform operations comprising:  
3 receiving packet data;  
4 concatenating the packet data into a Time Division Multiplexing (TDM)  
5 Synchronous Optical Network (SONET) signal, wherein the concatenation can be across  
6 any locations within the TDM SONET signal and wherein a size of the concatenation can  
7 be in increments of single SONET frames; and  
8 transmitting the TDM SONET signal having the concatenated packet data.

1 20. The machine-readable medium of claim 19, wherein the packet data is  
2 concatenated within locations in the TDM SONET signal not occupied by TDM data  
3 traffic.

1 21. The machine-readable medium of claim 19, wherein the transmitting of the TDM  
2 SONET signal is between two network elements in a network ring.

1 22. A machine-readable medium that provides instructions, which when executed by  
2 a machine, cause said machine to perform operations comprising:  
3 receiving a number of packets within a first Time Division Multiplexing (TDM)  
4 Synchronous Optical Network (SONET) signal having a number of SONET frames,  
5 wherein the number of packets are concatenated across any of the number of SONET  
6 frames within the first TDM SONET signal, such that a size of the concatenation can be  
7 in increments of single SONET frames;  
8 upon determining that the number of packets are being transmitted to a first  
9 location that cannot extract the number of packets from any of the number of SONET  
10 frames in the first TDM SONET signal, performing the following:

11 extracting the number of packets from the first TDM SONET signal;  
12 filling a number of SONET frames in a second TDM SONET signal with  
13 transmission data that includes the number of packets, wherein the filling is equally  
14 interleaved across the number of SONET frames in the second TDM SONET signal and;  
15 transmitting the second TDM SONET signal to the first location; and  
16 upon determining that the number of packets are being transmitted to a second  
17 location that can extract the number of packets from any of the number of SONET  
18 frames in the first TDM SONET signal, transmitting the first TDM SONET signal to the  
19 second location.

1 23. The machine-readable medium of claim 22, wherein the first location is a network  
2 element that is external to a network ring.

1 24. The machine-readable medium of claim 22, wherein the second location is a  
2 network element that is internal to a network ring.

1 25. A machine-readable medium that provides instructions, which when executed by  
2 a machine, cause said machine to perform operations comprising:  
3 receiving packet data;  
4 placing the packet data into buffers;  
5 determining packet boundaries among the packet data in the buffers, wherein the  
6 determining of the packet boundaries locates a number of packets;  
7 concatenating the number of packets into a Time Division Multiplexing (TDM)  
8 Synchronous Optical Network (SONET) signal, wherein the concatenation can be across  
9 any locations within the TDM SONET signal and wherein a size of the concatenation can  
10 be in increments of single SONET frames; and  
11 transmitting the TDM SONET signal having the number of concatenated packets.

1 26. The machine-readable medium of claim 25, wherein the number of packets are  
2 concatenated within locations in the TDM SONET signal not occupied by TDM data  
3 traffic.

1 27. The machine-readable medium of claim 25, wherein the transmitting of the TDM  
2 SONET signal is between two network elements in a network ring.

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